FORM PTO-1390 (REV 5-93) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
2296.2310	
U S APPLICATION NO (If known, see 37 C.F.R. 1.5)	
09/720207	
INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE
PCT/GB99/02111	2 July 1999 (02.07.99)
PRIORITY DATE CLAIMED	
2 July 1998 (02.07.98)	

TITLE OF INVENTION
COAGULATED PROTEIN

APPLICANT(S) FOR DO/EO/US
Tim FISHER and Charles S[illegible]

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the application time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information: International Search Report and International Preliminary Examination Report

U.S. APPLICATION NO. (If known, see 37 C F R 1 5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/720207	PCT/GB99/02111	2296.2310

17. [X] The following fees are submitted:

	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5):		
Search Report has been prepared by the EP or JPO **$860.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)) **$690.00**		
No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a)(1)) but international search fee paid to USPTO (37 CFR 1.492(a)(2)) **$710.00**		
Neither international preliminary examination fee (37 CFR 1.492(a)(1)) nor international search fee (37 CFR 1.492(a)(2)) paid to USPTO **$1,000.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a)(4)) and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$1,000.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ]20 [ ]30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed		Number Extra	Rate		
Total Claims	23	-20 =	3	X **$18.00**	$ 54.00	
Independent Claims	3	- 3 =	0	X **$80.00**	$	
Multiple dependent claim(s) (if applicable)				+ **$270.00**	$ 270.00	
TOTAL OF ABOVE CALCULATIONS =					$	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).					$	
SUBTOTAL =					$	
Processing fee of **$130.00** for furnishing the English translation later than [ ]20 [ ]30 months from the earliest claimed priority date (37 CFR 1.492(f)).					$	
TOTAL NATIONAL FEE =					$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +					$	
TOTAL FEES ENCLOSED =					$ 1,324.00	
					Amount to be:	
					refunded	$
					charged	$

a. [X] A check in the amount of $ 1,324.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-1205. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Fitzpatrick, Cella, Harper & Scinto
30 Rockefeller Plaza
New York, NY 100112-3801

SIGNATURE

Raymond R. Mandra
NAME

Registration No. 34,382

2296.2310

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
AS THE DESIGNATED/ELECTED OFFICE (DO/EO/US)

In re Application of:

Tim FISCHER et al

Application No.: 35 USC 371 of PCT/GB99/02111

Filed: July 2, 1999

For: COAGULATED PROTEIN

Examiner: N/Y/A

Group Art Unit: N/Y/A

December 21, 2000

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination on the merits, please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claims 14 and 15.

Kindly amend claims 3-12 as follows:

Claim 3, line 1, "claim" should read -- claims --.

Claims 4-5, line 1, "any preceding claims" should read -- claims 1 or 2 --.

Claim 6 (Amended) A method according to [any preceding claims] <u>claims 1 or 2</u> in which a blood fraction [(as defined herein)] is reacted with transition metal ions and the oxidising agent.

Claims 7-11, line 1, "any preceding claims" should read -- claims 1 or 2 --.

Claim 12, line 2, "claims 1 to 11" should read -- claims 1 or 2 --.

REMARKS

The claims are 1-13. Claims 14-15 were cancelled. Claims 3-12 have been amended to better define the invention and provide for proper multiple dependency. No new matter has been added. Accordingly, favorable consideration of the present claims is respectfully requested.

Applicants' undersigned attorney may be reached in our New York office at (212) 218-2100. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

Raymond R. Mandra
Attorney for Applicants
Registration No. 34,382

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-2200
Facsimile: (212) 218-2200

WO 00/01248

PCT/GB99/02111

09/720207

JC01 Rec'd PCT/PTO 22 DEC 2000

COAGULATED PROTEIN

The present invention relates to the preparation of a chunk of coagulated protein, and to the coagulated protein chunk itself.

Conventionally, protein can be coagulated in a variety of ways, for example by heating it or treating it with acid. It has now been found that a protein may be coagulated by adding transition metals ions and an oxidising agent to a protein and compressing the reaction product of the transition metal ions, the oxidising agent and the protein. A textured solid mass is produced which may have an internal texture similar to that of cooked meat.

According to the invention there is provided a method of forming coagulated protein chunk comprising adding transition metal ions and an oxidising agent to a protein and compressing the resulting reaction product to form a chunk having a laminar structure.

It is believed that the transition metal ions and the oxidising agent react to form free radicals and that the free radicals then react with the protein to coagulate it.

According to the invention there is also provided a method of forming a coagulated protein chunk which comprises: generating free radicals by reacting transition metal ions with an oxidising agent; reacting the free radicals with a protein; and compressing the reaction product of the free

radicals and the protein to form a chunk having a laminar structure.

The reaction of transition metal ions with the oxidising agent and/or the reaction of free radicals with the protein may be heated.

Preferably the oxidising agent is present at least 0.5% by weight of the protein.

Preferably the transition metal ions are present at least 0.5% by weight of the protein.

Preferably the protein comprises at least about 5%, preferably at least about 10% by weight of the reaction mixture.

Preferably the transition metal ions are ferrous ions.

Preferably the oxidising agent is hydrogen peroxide.

In a preferred embodiment of the invention there is provided a method of forming a blood chunk comprising heating a blood fraction (as defined below); treating the heated blood fraction with hydrogen peroxide; and compressing the reaction product of the blood fraction and hydrogen peroxide. The blood fraction is defined herein as comprising from about 14% to about 40% protein and about 35% to 45% red blood cells. The blood fraction may be formed in any way. The blood fraction may be the hæmoglobin fraction of blood (as defined below). Alternatively, the blood fraction may be formed by removing water from whole blood to concentrate it so that it comprises from about 14% to about

40% protein and about 35% to 45% red blood cells. The blood fraction may be reconstituted from purified protein and red blood cells. By the haemoglobin fraction is meant the residue from whole blood once the plasma, or most of the plasma, has been removed. The haemoglobin fraction consists of red and white blood cells with a residue of plasma. The haemoglobin fraction typically contains from about 14% to about 40% protein and about 35% to about 45% red blood cells. The remainder is mainly water together with other blood components.

It will be appreciated that the blood fraction is a source of protein and ferrous ions. When a blood chunk is formed according to this preferred embodiment of the invention, no addition of transition metal ions is required for coagulation of the protein. When other sources of protein are used, it may be desirable to add additional transition metal ions.

Preferably the hydrogen peroxide is added to the blood fraction at at least 0.5% by weight. There does not appear to be a significant upper limit to the concentration of hydrogen peroxide in the reaction mixture which is effective to cause the desired reaction to take place; concentrations of up to 3% (by weight) have been found satisfactory.

Preferably, compression is carried out at a temperature greater than 60°C.

Preferably the blood fraction is heated to between 60°C and 80°C before addition of the hydrogen peroxide.

Preferably the blood fraction comprises at least about 10%, more preferably at least about 15%, by weight protein. At lower protein concentrations, the reaction product does not absorb all the water present in the reaction mixture. Such products are useful and their manufacture falls within the scope of the present invention; however, it will usually be necessary to remove the proteinaceous material from the unabsorbed water before it is used.

Additives may be included in the blood fraction to modify the nutritional content and flavour of the chunks. It is preferred that the pH of blood fraction is no less than 4, and that it is no greater than 9.

Compression of the reaction product of the blood fraction and hydrogen peroxide can be carried out on the reaction product as it is formed, or the reaction product can be stored and then subjected to heating, for example by microwave radiation, prior to compressing. Alternatively, the reaction product may be steamed to give a product having a jelly-like texture. The steaming can be carried out with meat juices or other flavoured aqueous media to impart particular flavours to the product.

The product can be dried, preferably at about 60°C, to produce hard, crunchy chunks, which are useful as a dry pet food.

The reaction product of the blood fraction and hydrogen peroxide can be compressed under its own weight.

The reaction product may be compressed as a result of restriction of any expansion of the reaction product caused

by evolution of gas as the transition metal, oxidising agent and protein react.

The pressure at which the reaction product of the blood fraction and the hydrogen peroxide is compressed to achieve the laminar internal structure is not critical; a pressure of up to about 400 kPa is preferred.

Also according to the invention there is provided an edible chunk comprising a major proportion of protein, preferably blood protein, and having a fibrous, laminar internal structure.

The invention will be further described, by way of example, with reference to the drawings in which;

Figure 1 shows schematically a method according to a first embodiment of the invention;

Figure 2 shows schematically a method according to a second embodiment of the invention; and

Figure 3 shows schematically a method according to a third embodiment of the invention.

The methods according to the invention shown in the drawings include the following common features. The hæmoglobin fraction of blood is pumped from a tank 10 by a peristaltic pump 12 to a steam infuser 14 where the hæmoglobin is heated to about 75°C. The heated hæmoglobin passes from the steam infuser 14 to a high shear mixer reactor 16, such as a Dispax reactor. In the Dispax reactor, the hæmoglobin is reacted with hydrogen peroxide pumped from a hydrogen

peroxide tank 18 by a hydrogen peroxide pump 20. In the reactor 16, the hæmoglobin and the hydrogen peroxide are mixed efficiently. Preferably, the reactor is a high shear, low volume mixer to ensure adequate mixing of the two components.

In the first embodiment of the invention, shown in Figure 1, the foam reaction product 22 is deposited in a tray 24. The reaction product 22 can be allowed to be compressed by its own weight, in which case the solid mass produced is elastic and can be cut up to provide elastic chunks. Alternatively, pressure can be applied to the reaction product 22 in the tray by application of a pressure plate 26. On release of the pressure plate a solid product 28 having a fibrous, laminar internal structure is produced, which can then be cut into chunks 30 as at 32.

In the second embodiment of the invention, shown in Figure 2, the reaction product 22 from the reactor 16 is passed to a piston pump 40 in which the reaction product is compressed. As the reaction product 22 leaves the piston pump 40, it is diced as at 42 to produce chunks 44 having a fibrous, laminar internal structure.

In the third embodiment of the invention, shown in Figure 3, the reaction product 22 leaves the reactor 16 through a disperser 50, from where it passes into a mouth formed by the widely separated ends of two converging continuous belts 52, 44. The reaction product is compressed between the two continuous belts, and the resulting solid sheet 56 is cut into chunks 58 as it leaves the continuous belts 52, 54, as at 60. Again, the chunks produced have a fibrous, laminar internal structure.

The chunks have a fibrous, laminar internal structure, similar to that of meat chunks, so that the chunks can be readily used in canned food stuffs such as pet foods to provide a protein source which is analogous in appearance and texture to meat.

CLAIMS

1. A method of forming a coagulated protein chunk comprising adding transition metal ions and an oxidising agent to a protein and compressing the resulting reaction product to form a chunk having a laminar structure.

2. A method of forming a coagulated protein chunk comprising: generating free radicals by reacting transition metal ions with an oxidising agent; reacting the free radicals with a protein; and compressing the reaction product of the free radicals and the protein.

3. A method according to claim 1 or 2 in which the compression is carried out at a temperature greater than 60°C.

4. A method according to any preceding claim in which the compressed product is dried.

5. A method according to any preceding claim further comprising steaming the reaction product of the transition metal ions, the oxidising agent and the protein.

6. A method according to any preceding claim in which a blood fraction (as herein defined) is reacted with transition metal ions and the oxidising agent.

7. A method according to any preceding claim in which the transition metal ions are ferrous ions.

8. A method according to any preceding claim in which the oxidising agent is hydrogen peroxide.

9. A method according to any preceding claim in which the oxidising agent is present at at least 0.5% by weight of the protein.

10. A method according to any preceding claim in which the transition metal ions are present at at least 0.5% by weight of the protein.

11. A method according to any preceding claim in which the protein comprises at least about 5%, preferably at least about 10%, protein by weight of the reaction mixture.

12. Coagulated protein formed by a method according to any of claims 1 to 11.

13. An edible chunk comprising a major proportion of protein, preferably blood protein, and having a fibrous, laminar internal structure.

14. A method substantially as described.

15. A chunk substantially as described.

09/720207
PCT/GB99/02111

WO 00/01248

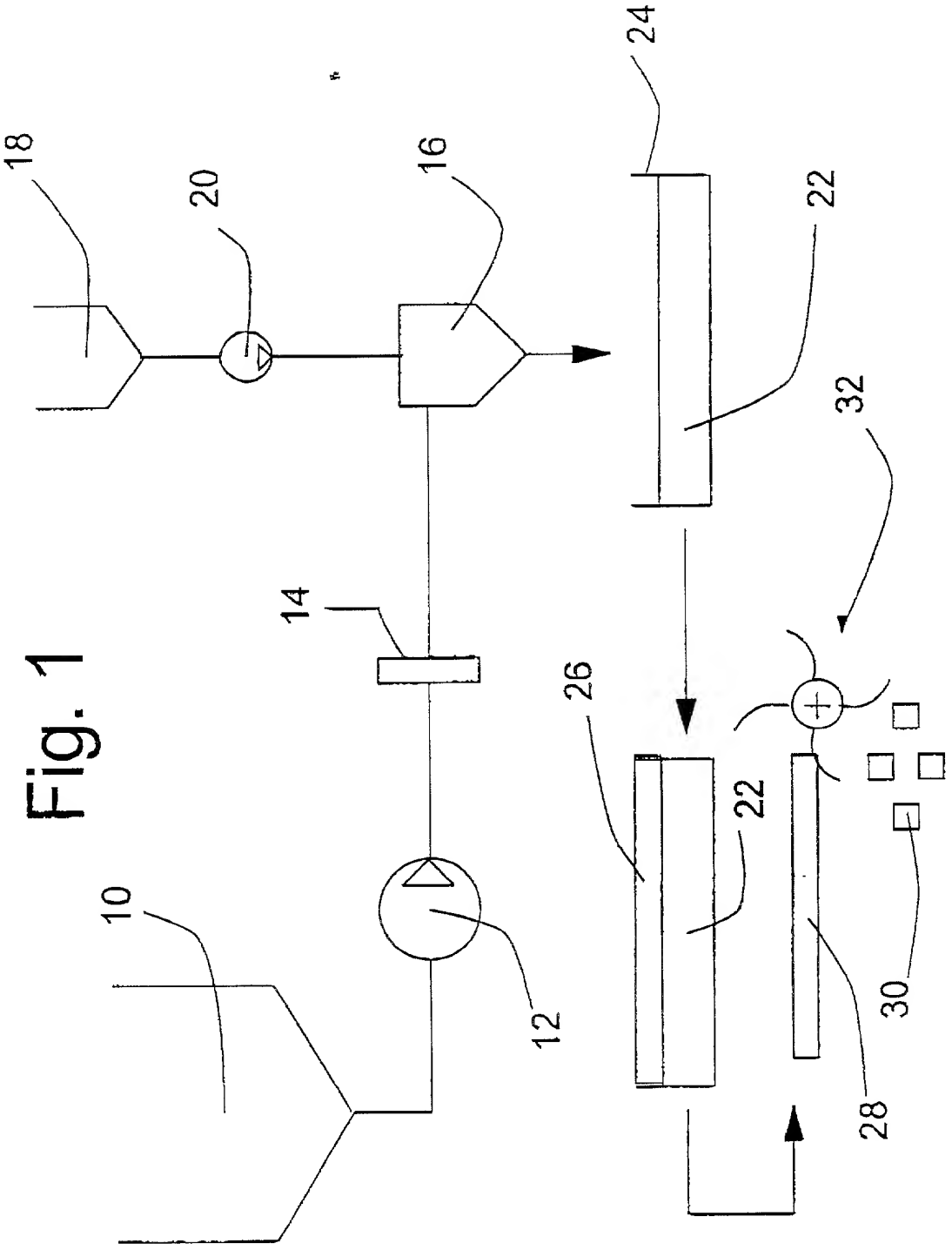

Fig. 1

09/720207
PCT/GB99/02111
WO 00/01248

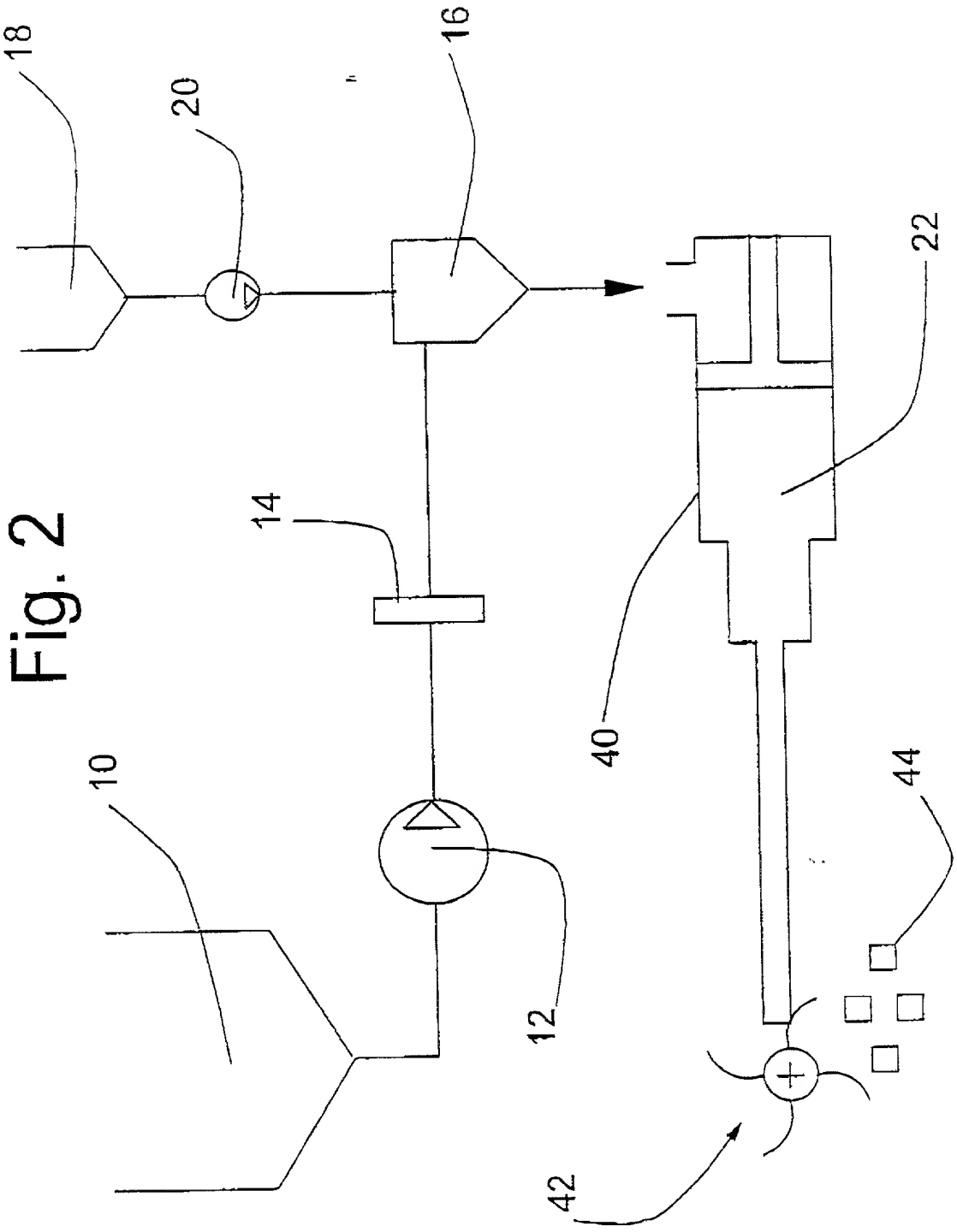

Fig. 2

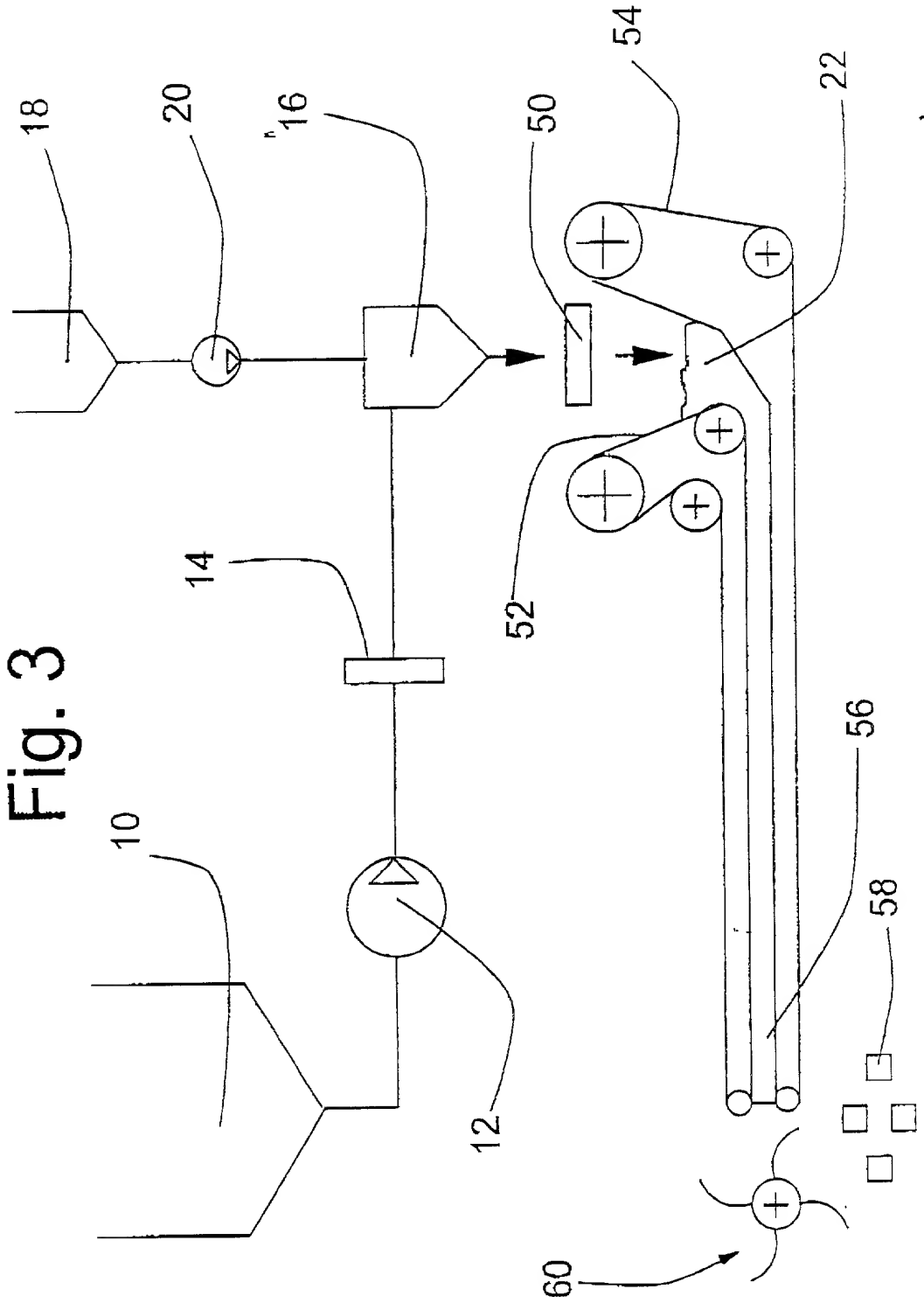

Fig. 3

2296.2310

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT COOPERATION TREATY APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled COAGULATED PROTEIN

the specification of which was filed as PCT International Application No. PCT/GB99/02111 on 2 July 1999 and was amended under PCT Article 19 on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) on which priority is claimed:

Country	Application No.	Filed (Day/Mo./Yr.)	Priority Claimed (Yes/No)
U.K.	9814395.1	2 July 1998	YES
U.K.	9814396.9	2 July 1998	YES

I hereby appoint the practitioners associated with the firm and Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to the address associated with that Customer Number:

FITZPATRICK, CELLA, HARPER & SCINTO
Customer Number: 05514

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole or First Inventor: Tim FISHER
Inventor's signature _____
Date 5-6-01 Citizenship/Subject of United Kingdom ENG
Residence 13 Hall Orchard Lane, Frisby on the Wreake, Melton Mowbray, Leicestershire LE14 2NH, England
Post Office Address same as above

Full Name of Second Joint Inventor, if any Charles SPEIRS
Inventor's signature _____
Date 5.6.01 Citizenship/Subject of United Kingdom
Residence 17 Stapleford Road, Whissendine, Oakham, Rutland/Leicestershire LE15 7HF, England ENG
Post Office Address same as above

Form #37